

Development of optics and microwave multiplexers for far-IR and millimeter detector arrays

Completed Technology Project (2017 - 2021)



Project Introduction

The future of experimental cosmology and astrophysics is intimately tied to the progress of remote sensing technology of millimeter and far-IR instruments. I will contribute to this progress by designing new optics and receiver technologies to increase throughput, speed, and sensitivity. Specifically, I will 1) develop high-throughput optics by using micro-machining technologies to fabricate highly efficient anti-reflection (AR) coatings at far-IR and mm wavelengths and by 2) designing and testing new transition edge sensor (TES) bolometer readout architectures based on microwave superconducting quantum interference device (SQUID) multiplexing. My contributions to these technologies will further the development of diffraction limited performance across large-format, low noise, high density focal plan detector arrays resulting in new technologies applicable to a broad range of NASA missions and experimental cosmology instruments. With the technologies that I propose to develop, we will have the potential to probe a wide range of astrophysics such as the physics of inflation at fractions of a second after the big bang, the evolution of protoplanetary disks, and star formation in nearby galaxies.

Anticipated Benefits

This research will further the development of diffraction limited performance across large-format, low noise, high density focal plan detector arrays resulting in new technologies applicable to a broad range of NASA missions and experimental cosmology instruments. Developing these technologies will have the potential to probe a wide range of astrophysics such as the physics of inflation at fractions of a second after the big bang, the evolution of protoplanetary disks, and star formation in nearby galaxies.



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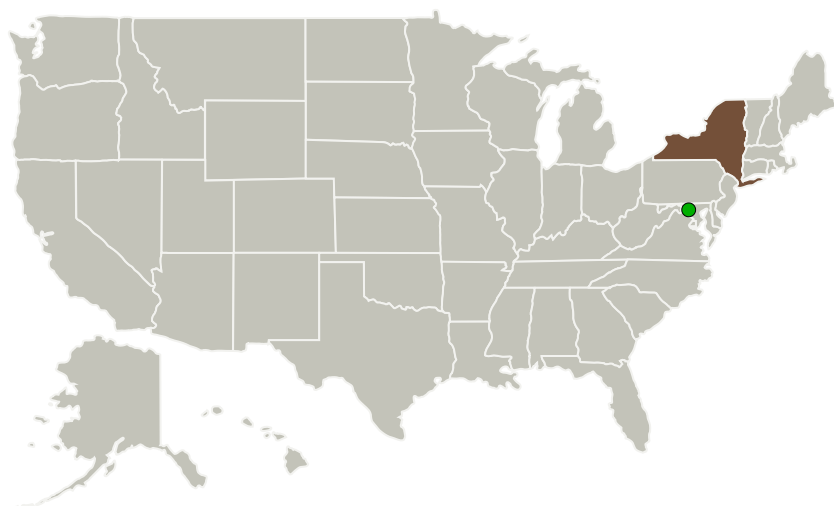
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Cornell University	Lead Organization	Academia	Ithaca, New York
 Goddard Space Flight Center (GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

New York

Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornell University

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Michael D Niemack

Co-Investigator:

Nicholas F Cothard

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Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System